Automotive and Trucking Information Systems - Implications for General Aviation Cockpit Weather Systems

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Overview

- Automotive / trucking system overview and intelligent transportation systems
  - Examples and cost factors
  - Product development factors
- Product development models in ITS
  - QFD – Kano model

A / T Research Objective

- To investigate current features, technologies, and future developments of Intelligent Transportation Systems in the automotive / trucking industries with implications for GA cockpit information systems

Definition of Intelligent Transportation Systems

- In-vehicle information systems that combine information processing, communications, control, and electronics.

- Purpose:
  - Improve safety
  - Decrease on-route time and money consumption

Example- ITS Equipment Cost in Trucking Industry

- @Track Communications: HighwayMaster System:
- Non-recurring cost: $1,700 per vehicle
- Recurring cost:
  - 50 cents per message
  - Approximate monthly cost $55 per truck (based on the data of Core Carrier Corp.)

Future ITS Product Development Trucking Industry

- Internet access
- Traffic information services integrated with route optimization
- Increased capacity and baud rates
- Increased and improved voice recognition

Example: ITS Equipment Costs in Automotive Industry

- Mercedes-Benz System (in 2001):
  - Push-button info from personalized web page
  - Text messages
  - Integrated into front panel
- Cost: $125 annual

Automotive Industry: Future ITS Product Development

- Build on cellular technology

- Increased use of voice recognition

- Internet access through customized web page: email, stocks, sports, news, weather

  – General Motors: Weather info via a touch button; current forecast or alert conditions.

  – Jaguar - Motorola: Access to Internet content on the system's microbrowser. Traffic, maps, weather, news, other info.

Message from GPS Growth
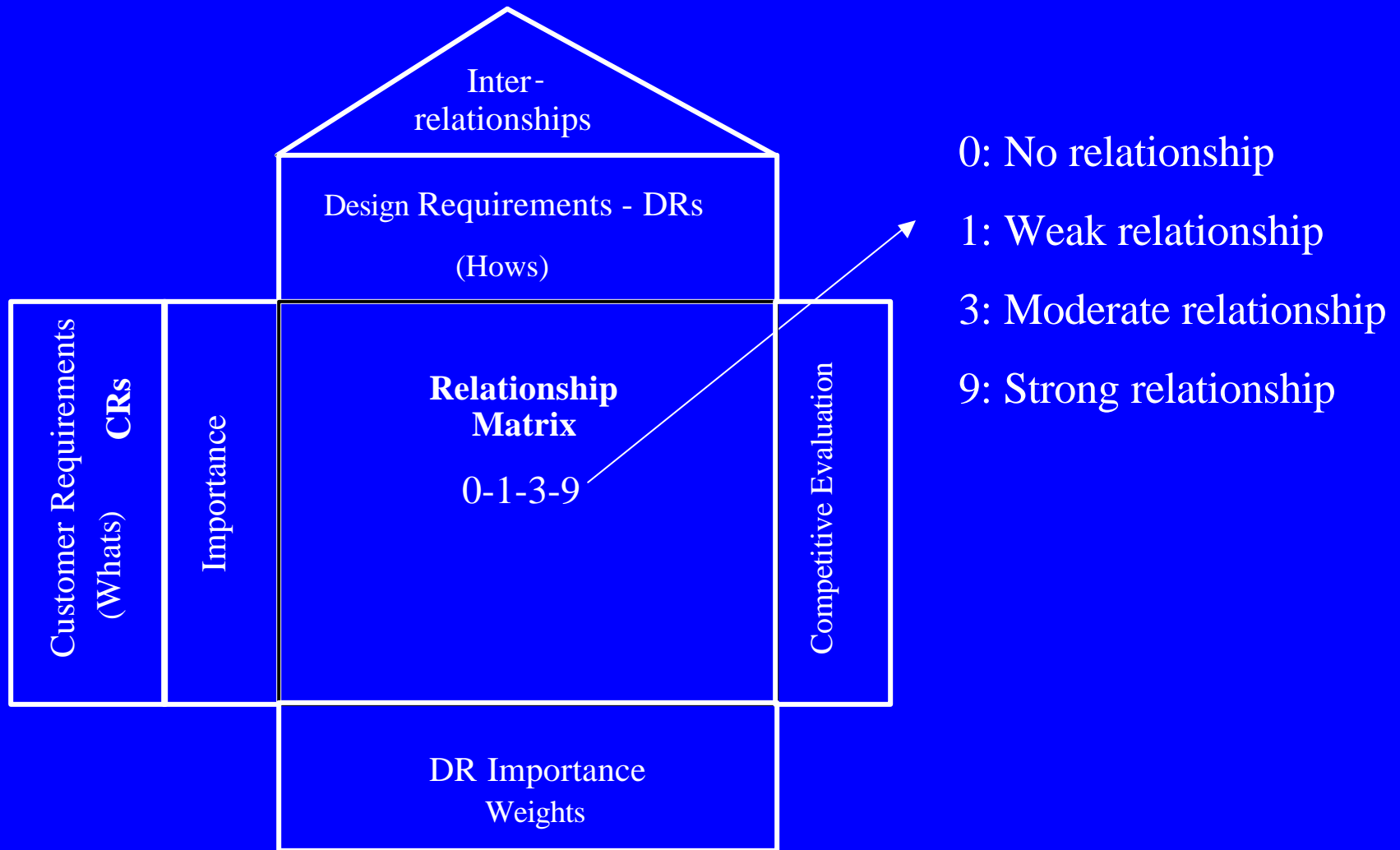
GPS: a model for related technologies:

- Continued reduction in costs of GPS units.

- Increasing integration of GPS with other information technologies.

- Leads to attractive high margins for GPS-enhanced products rather than core technology.
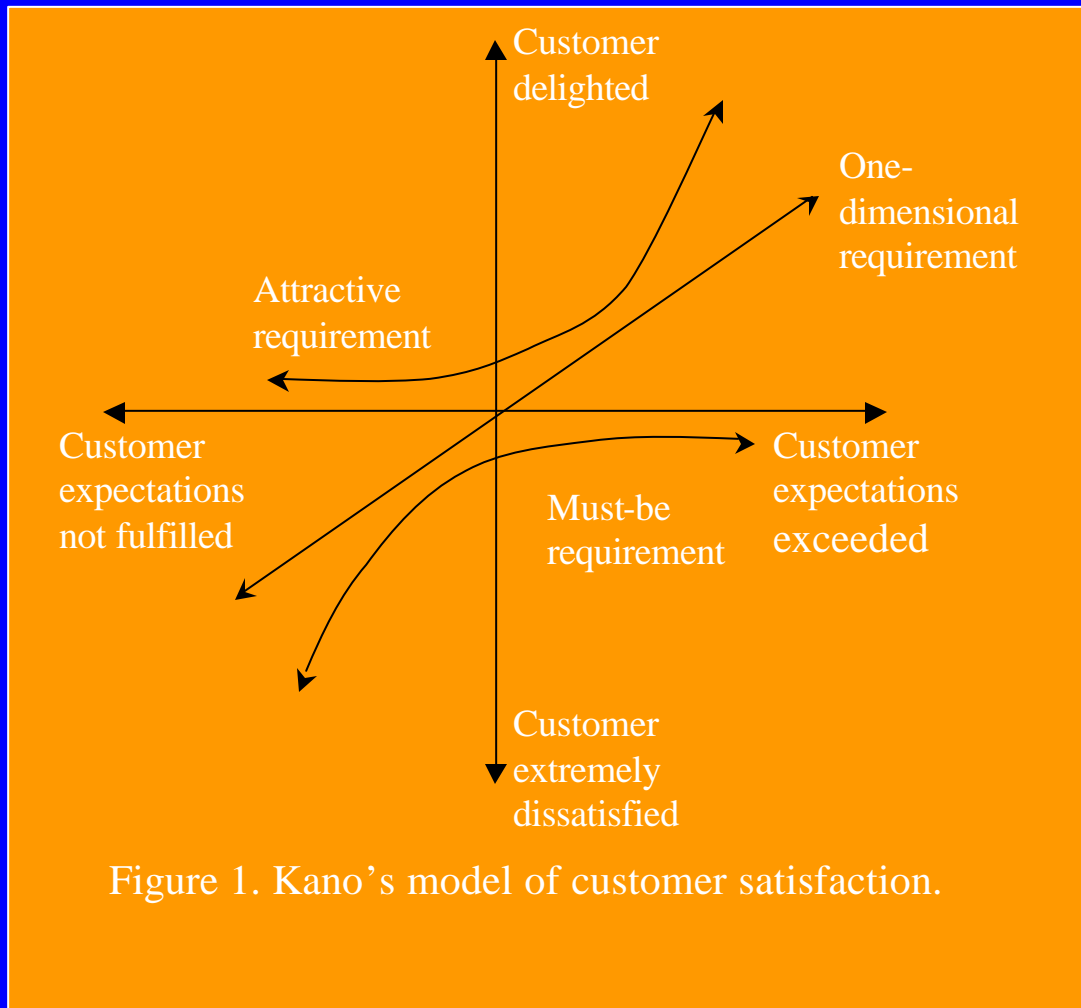
System Integration = Value Added Margins

Product Development Decision Model

- *Quality Function Deployment:*
  - *Technique / methodology that can systematically transform market defined customer needs into product specifications.*
  - *In product development, identify promising technologies.*

General Framework of QFD's House of Quality

Inter-relationships

Design Requirements - DRs

(Hows)

Customer Requirements (Whats) **CRs**

Importance

Relationship Matrix

0-1-3-9

Competitive Evaluation

DR Importance Weights

0: No relationship

1: Weak relationship

3: Moderate relationship

9: Strong relationship

Research Methodology: Kano Model

Customer delighted

One-dimensional requirement

Attractive requirement

Customer expectations not fulfilled

Must-be requirement

Customer expectations exceeded

Customer extremely dissatisfied

Figure 1. Kano's model of customer satisfaction.

Integration of Kano model in survey of aviation data weather users to validate importance and identify extremes of satisfaction

Examples: Customer Requirements

- No. of Graphical Wx Products
- Grid Size
- Weather Updates
- Hazardous Wx Alerts
- Location-Aware Weather Information
- Integrated weather and traffic

Examples: Design Requirements

- User Data Rate
- Request / Reply Capability
- Traffic Info Capability (Multi-Service Capable)
- Capacity
- Network Coverage
- Latency
- Connection Delay
- Position Reporting

Example Results

CRs

DRs

		Data rate	Reqyuest reply	Network coverage	Latency	Position reporting	
# of Graphical weather prods	30%	0.29	0.19	0.13	0.12	0.26	
Grid size	20%	0.23	0.11	0.23	0.19	0.23	
Update rate	15%	0.28	0.26	0.16	0.12	0.18	
Alert capability	10%	0.23	0.20	0.19	0.19	0.19	
Weather - traffic integration	15%	0.18	0.23	0.27	0.21	0.12	
Location - awareness	10%	0.32	0.11	0.13	0.13	0.31	
Design Requirement Importance		0.26	0.18	0.18	0.15	0.22	1.00

Design requirement importance is then mapped against various data link technologies.

Outcome of QFD Model

- Definitions of potentially successful products for different market segments

- Product development suggestions to information system providers

- Selection of promising technologies to provide customer requirements at effective cost.

Summary

- Auto truck systems are moving to greater levels of integration to produce more value added systems
  - Aviation weather fits this model – value of whole worth more than individual parts
- Tested product development models needed to assist in selection of technologies that can support these pathways.